United States
Environmental Protection
Agency

Region 5
77 West Jackson Boulevard
Chicago, Illinois 60604

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TECHNICAL FACT SHEET FOR LEAD (Pb) HAZARDS AND ALTERNATIVES

Lead is one of the PBT chemicals that has been identified as a priority. Lead has many properties which make it useful in industrial settings, including its chemical stability. These very properties make lead persistent once it has entered the environment.

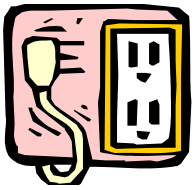
One of the reasons that lead has been listed as a PBT is that it affects almost every organ and system in the body, especially the nervous system. Lead can have long-term adverse health effects for workers that encounter significant exposures at the workplace and, especially, for children and people exposed as children. Lead affects both the male and female reproductive systems, and may harm fetuses.

EPA PARTNERSHIP AND YOU...

The United States Environmental Protection Agency (EPA) has identified numerous persistent, bioaccumulative and toxic (PBT) chemicals that may be present in some industrial hazardous wastes regulated under the Resource Conservation and Recovery Act (RCRA). In addition to its ongoing regulatory activities, EPA will focus voluntary efforts on actions that reduce the generation of these PBT chemicals. EPA will also work with states, industry, and environmental groups through workshops, technical assistance programs, partnership agreements, regulatory reinvention projects, and other strategies to promote progress toward the goal of reducing the generation of RCRA PBT's in hazardous waste by 50 percent by the year 2005.

THE LEAD CONNECTION

Lead is used in a wide variety of industrial settings due to its ease of casting, high density, low melting point, low strength, ease of fabrication, acid resistance, electrochemical reaction with sulfuric acid, and chemical stability in air, water, and soil. Releases of lead to air, water, and land



are regulated by several agencies, including public health and environmental agencies, and pieces of legislation, including; RCRA, the Emergency Planning and Community Right-to-Know Act (EPCRA); Clean Air Act; Comprehensive Environmental Response, Compensation and Liability Act (CERCLA); National Primary Drinking Water Regulations; Safe Drinking Water Act; and as a primary pollutant under the Clean Water Act. The same properties that make lead useful in industrial settings are often the cause for its regulation. For this reason, many industries are finding ways to maintain production levels and profits while decreasing the amount of lead used in their processes or applications.

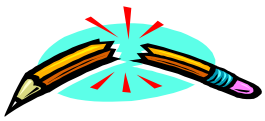
Here are a few of the industrial uses for lead:

- Electroplating
- Sheet lead, solder, and pipes
- Electrical equipment
- Lining for chromium plating tanks
- Castings, bricks, and shields for X-ray and nuclear shielding purposes
- Lining, pipe, and sheet in the manufacture, handling, and storage of corrosive chemicals
- Pigment in lead-based paint and ceramic glazes
- Stabilizer in plastics

Here are some of the industries that may use lead:

- Electronics
- Glass manufacturing
- Printing
- Plastics
- Auto repair
- Metal finishing
- Plumbing/pipe repair

BREAKING THE TIE WITH LEAD



There are many different alternatives available to substitute in place of lead. When a company decides to replace or eliminate lead, the facility should evaluate their processes and test several applications to determine what replacement method would best fulfill its needs. Many resources such as industry trade associations, the Internet, state pollution prevention technical assistance providers and consultants may be able to help you identify lead substitutes for your application. Here are several examples of replacement alternatives:

Lead-Free Solder - Safe, reliable, nontoxic, and cost-effective substitutes exist for lead-bearing solders for certain applications in electronics manufacturing. More than 30 lead-free alloys are available for application to almost all soldering applications. The National Center for Manufacturing Sciences conducted the Lead-Free Solder Project, which tested and analyzed alternative alloys for use in the electronics industry. Results of the study can be ordered from the NCMS website (http://lead-free.ncms.org).

Lead-Free Plating/Coating Systems - Protective coatings such as electrocoatings, powder coatings, and bearing adhesives are available in non-lead, VOC compliant form. Use of these non-toxic coatings reduces or eliminates lead disposal costs. Many companies are experimenting with plating and coating systems that are lead-free, or process changes that create closed-loop systems for process wastewater and other media containing lead.

Lead Recycling/Reuse - Lead can be successfully recycled or used for energy-recovery. Waste management information from the Toxic Release Inventory (TRI) indicates that almost 1 billion pounds of lead were recycled and 320,000 pounds of lead were used for energy recovery in 1998. Reusing or recycling lead within a facility not only reduces or eliminates the cost of lead disposal, but can also result in cost savings due to a decrease in the need for raw product.

Other Lead-Free Alternatives - In addition to the lead-free alternatives mentioned above, consider how the following could reduce the amount of lead you manage:

- It is now possible to replace lead used in the manufacture of pipes, brass, solder, paint, glass, and glazes with less-toxic substitutes.
- For batteries, many less-toxic substitutes have been developed as alternatives to lead-containing battery applications.
- Plastics and composite materials, some that are mixed with less toxic metals, may substitute for lead used for shielding applications. Other plastics, composites, or metals may replace lead in applications where lead is used for its high density.
- Vehicle wheel balancing weights have typically been made of lead. Most of these lead weights enter the environment by falling off the wheels or when the vehicle is disposed. Non-lead substitutes may easily be used in place of lead for this application. The more vehicles that are managed in your fleet, the greater the reduction that may be realized by using a non-lead balancing weight substitute.

MEASURE YOUR SUCCESS

Many companies have benefitted by replacing products and processes that rely on lead, and simply using the available environmentally friendly alternatives. Using these alternatives has reduced the need for lead disposal and has also reduced the need to buy lead as a raw material. Here are some success stories for several companies that have switched to lead-free alternatives:

- During the replacement of new telecommunications cable at the Hanford Reservation in Richland, Washington, the old, lead-coated cable was recycled through Hanford's Recycle Program. Although some separation of materials was necessary, the recycling realized a cost savings of $7,010.

- One company replaced a tin/lead electroplating metal finishing bath with a new process in which pure tin was used as the coating with sulfate-based plating. This eliminated lead from the wastewater, which then became easier to treat. The increased raw material cost for pure tin plating was found to be offset by the cost reduction in waste treatment. Since the new process involves only the direct substitution of tin/lead plating with pure tin plating, it does not affect other manufacturing processes. The new process has operated for over 2 years with no adverse effects on product quality.

- An Ohio company has found a way to replace lead foil/paper X-ray grids with aluminum grids. If approved, the change would eliminate not just the lead component of the grids, but also the adhesive containing methyl isobutyl ketone and metyl ethyl ketone, and the acetone used to clean the grids.

- A manufacturer of electric motor parts redesigned operations that generated lead-contaminated dust to reduce the volume of dust created, and to capture other materials for reuse before they were contaminated with lead. The company has reduced its hazardous waste generation while maintaining a 10-percent growth in production. The waste reduction activities have resulted in waste disposal savings of approximately $200,000 annually.

Lead has been a common ingredient in paints, plastics, ceramics and glazes. The amount of lead added to these products has been reduced because of lead's harmful human health effects. However, exposure still occurs, mainly from previously existing sources, such as paint in older homes and lead-stabilized plastics that have been subjected to degradation. Exposure to lead in homes can cause numerous adverse health effects, especially for children. These health effects can be reduced by choosing new paints, plastics, and glazes that do not contain lead, and by using caution when removing old paint that contains lead. Information about lead-based paint can be obtained from the U.S. EPA Office of Pollution Prevention and Toxics at www.epa.gov/opptintr/lead/index.html, or by calling the National Lead Information Center (NLIC) at 1-800-424-LEAD or the NLIC Hotline at 1-800-LEAD-FYI. Information may also be available from state environmental or public health organizations.

FOR MORE INFORMATION...

There are various resources to locate more information on the substitution and potential elimination of lead from your workplace. Here a just a few of the Web sites available via the Internet and government agencies listings that would be able to provide more information.

Web sites

- lead-free.ncms.org
- es.epa.gov (EnviroSense)
- www.p2gems.org
- www.state.in.us/oppta/index.htm
- www.mntap.umn.edu
- www.epa.ohio.gov/opp
- www.deq.state.mi.us/ead/p2sect/
- www.epa.gov/opptintr/p2home
- www.nsc.org/ehc/ew/chems/lead.htm
- www.manufacturing.net/magazine
- www.epa.gov/iris/subst/0277.htm
- www.tdh.state.tx.us/lead/facts.htm
- www.mtsc.unt.edu
- www.emcentre.com/unepweb/tec_case/commun_32/newtech/n1.htm

Government Listings

U.S. EPA Region 5
P2 Hotline
⇨ 888/745-7272 (888-PIK-P2P2)

Illinois Environmental Protection Agency
Office of Pollution Prevention
⇨ 217/782-8700

Indiana Dept. of Environmental Mgmt.
Office of Pollution Prevention
⇨ 317/232-8172

Michigan Dept. of Environmental Quality
Environmental Assistance Division
⇨ 800/662-9278

Minnesota Technical Assistance Program
⇨ 612/624-1300

Ohio Environmental Protection Agency
Office of Pollution Prevention
⇨ 614/644-3469

Wisconsin Dept. of Natural Resources
Cooperative Environ. Assistance
⇨ 608/267-9700

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